



## Supply chains: healthcare

### *The steriliser's tale*

#### **James Warren**

Here's a pair of scissors. What's the life span of one of these?

#### **Graham Cox, Decontamination, Lead Manager, Leeds General Infirmary**

If you buy quality instruments from a reputable company, well then really you're looking at, to a certain extent, an unlimited life on that item. With good care, looking after it, regular maintenance, sending off for sharpening, various things like this, well, then, it's not uncommon to have items or instruments in the supply chain for 20, 25 years.

#### **James Warren**

Understanding something of what happens to these products in a hospital is central to understanding an important part of the healthcare supply system. This is part of the internal supply chain.

In Leeds General Infirmary, John is making one of the regular 30 minute collections of used surgical instruments from the operating theatre suites. John is leaving the empty trolley to receive the next batch of soiled instruments, contaminated with blood, bone fragments and possibly infectious tissue. The loaded trolley is on its way to the sterile services department.

#### **Graham Cox**

This set has been used in the operating theatres. With this particular sort of set - this is an ENT set - the equipment potentially is infected, because it has been used on a patient, we don't know whether they've had any sort of medical complaints. It's brought down in the rigid container, and what Lynne is doing now is sorting the instrumentation out, opening the instruments up, putting them on spikes or into a protective basket, and then what she'll do is she'll introduce the instruments into this basket which will go through the ultrasonic washer where, as for the container itself, because it's aluminium based, that will then go through the tunnel washer.

From this department here, the HSDU at Leeds General Infirmary, we supply 35 theatres with their equipment. If you're looking at it on a sort of a monthly sort of scale, we're looking at something like about six and a half thousand theatre trays, probably something like 35,000 individual instruments for the dental hospital, 13,000 linen packs, and probably about 25,000 single items, which could be for the theatres or for the wards.

What we see here, first of all, is a rinse tank. What we have is the instruments going in there. They are contaminated with gross contamination, blood tissue, various products like that. Water, it's a tepid temperature, probably about 45 degrees centigrade, is being sprayed on them. That will get rid of the gross contamination that's on the equipment. If that water is any hotter than that, what will happen is you will cause protein coagulation and will harden the materials on the instrument and then make the washing process that little bit harder.

From the rinse it will then go into the ultrasonic tank. Water at 85 degrees centigrade, to which there is an enzyme detergent. A radio frequency wave is applied to the fluid and what that will do is cause very minute bubbles to form in the water. The bubbles will grow at a sort of a set rate, they will then reach a critical size where they will implode. The implosion of the bubble in fact will cause a scouring sort of action and that will draw the debris off the instruments. You'll see that the process here is controlled by a robot arm and that will in fact move the baskets along at a set rate, so that when we sort of talk to the staff in the production room and say that things have been sufficiently decontaminated, will then, because we know the sort of parameters and the specifications, that we're sure of our facts on that. From the ultrasonic bath it will then go into the decontamination or the disinfection bath. The ultrasonics will clean the equipment, the decontamination bath will actually firmly disinfect the equipment.

The third bath, this is where the instruments, they've been through the main part of the washing process, so they could still have some chemical detergent contaminates residual onto the instrumentation. So in there we do have hot water which will very simply rinse any sort of contaminates off which are still on the instruments. At that stage we can also introduce a rinse aid to the solution so that that will reduce any spotting or water stains on the instruments, so they will look all nice and shiny when they've actually passed through.

The very last stage on the ultrasonic process is where the equipment is dried. And very simply hot air is blown over the instrumentation for about 5 minutes to actually dry it before it is then passed through into the clean room. The whole process from going in dirty to coming out disinfected, and passing into the clean room takes about 25 minutes.

#### **James Warren**

Tracking the consignment is part of the quality system. If there's a problem, the hospital can trace when, and on exactly which machine, the batch was decontaminated. The next stage is carried out in a clean room – so clean that even the camera crew have to scrub up and wear gowns.

#### **Graham Cox**

We're now in the second sort of department within the sterile services and this is the clean room area. Whereas in the wash room, that's where the instrument sets came from the theatres, potentially infected, they've now been through an automated washing process, and because we know the various temperatures and the various sort of times that the instruments were in that sort of part of the cycle, well, then we know that when they come in here they're safe to handle by the staff because they've been firmly disinfected. And as you see, Maureen now has picked up a set which she is taking over to the work bench where she will start preparing it and inspecting the instrumentation ready to be put into the completed container. Maureen will check all the instrumentation which is in that container, make sure that the contents of it are to the agreed levels. What that means is that with the users, they've come up with a preferred contents for that particular set. She will make sure that all the instrumentation is clean, functional, sharp and she will actually account for it in the container. She will put it in the container and then she will seal that using various sort of safety seals. And when she's happy with the container she'll then take it round to the watch clave, pre-hold area round the corner, where it will be held until there is an autoclave case ready to actually process it.

#### **James Warren**

With the equipment checked and signed off, it then has to be packed for sterilisation. You've already seen that B Braun – as well as other manufacturers – offer a standard container suited for sterilisation. Packing that with a microbiological filter, and attaching heat sensitive seals which confirm that sterilisation has been completed, is all that has to be done.

To see what an advantage that is, contrast it with what has to be done to a non-packaged load. The outer layer is porous paper, it's there so that subsequent handling during transit doesn't affect the contents. The blue fabric is to contain any sharp corners or edges that could damage the integrity of the package. Double-wrapping in green and blue porous paper follows a standard hospital procedure.

The paperwork travels inside the wrapped parcel as well.

At every layer, heat sensitive tape is used. This changes colour to confirm the sterilisation.

Only now, labelled and wrapped, can the package continue to the next stage. The bar codes are still tracking the package. Eventually one of these labels will be attached to the patient's notes.

#### **Graham Cox**

This is the steriliser area. We've got a bank of four porous load autoclaves. The porous load indicates, in fact, that the sterilisers can pull a vacuum, and that's of critical importance down here

because, as you've seen, most of the sets that we make up are, in fact, either wrapped or in containers. And what we must do is, in fact, take the air out of the chamber so that the steam can come in direct contact with the instruments to achieve sterility. What we're trying to do is raise the temperature above 100 degrees Centigrade and so what we do is we seal a chamber, apply heat to it, and by pressurising it, then we can raise it above 100 degrees centigrade. To, in fact, kill spores, then we do have to raise the temperature quite high, and these machines down here will raise the temperature to 134 degrees Centigrade. 134 Centigrade for three and a half minutes, providing you've got air extraction, is sufficient to kill the bacteria that might be on any of the products that are going through the autoclaves. The whole process takes probably about 35 minutes, from going in unsterile to actually coming out, shall we say, sterile and ready to use.

#### **James Warren**

Only now can the load, sterilised and ready for use, be taken off to the holding area outside the theatres. As a further sterile precaution, it's a separate transfer, quite distinct from the collection of the used instruments. This care is one example of how the healthcare supply chain differs from sectors where human life is not the critical factor. One important tool of value engineering is the elimination of waste and duplication. If you work closely with your suppliers and can trust them, you can save on inward inspection, relying on the supplier to have done the job for you. Even in the best circumstances that can't be relied on in health care.

#### **Graham Cox**

Like a lot of trusts we actually hire equipment to come into the trust, so that it can be used for one-off operations. Because we don't really know where this equipment has been previously used, we don't know what the state of it is, irrespective of what the, shall we say, the company says or the representative says, or in the case if a hospital loan us equipment, we treat everything suspect. So even if you come to me and say 'this is sterile, this is clean,' whatever, well, then we'll say, 'yes,' and we'll still in fact process it through the normal sort of run. So it'll go through the washing machines, it'll still be re-checked, in the packing room, and it'll still go through the steriliser, for use by the clinician, before we allow anything else to go on.

#### **James Warren**

Decontamination and sterilisation units are only a small part of the total healthcare supply chain. In the next section, we'll take a broader view.